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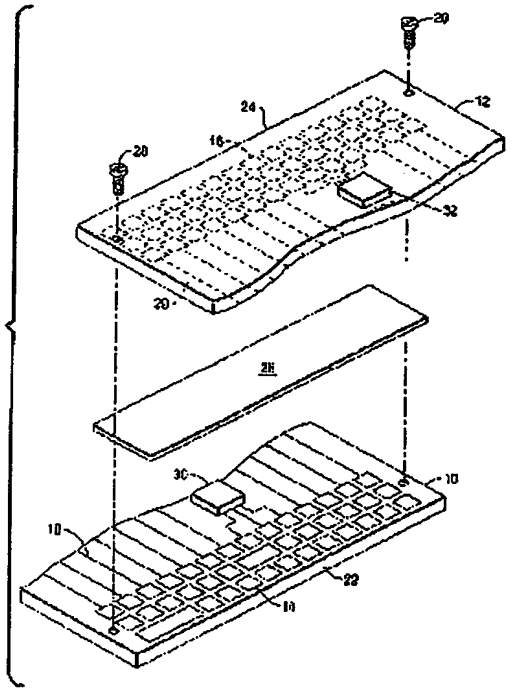
(54) Printed circuit board assembly

(57) A printed circuit board assembly includes two-dimensional arrays of connectors (14,16) to provide significantly higher data transfer rates than typical one-dimensionally arranged connectors, without sacrificing board space. The assembly includes a plurality of connection pads (14,16) on each printed circuit board (10,12). A layer of anisotropically conducting material (26) is placed between the connection pads and the boards are held together by fastening screws (28).

FIG. 1



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Description

This invention relates to printed circuit board assemblies.

Today, processor clock frequencies within computers may exceed 100MHz. Thus, data may be transferred at high speeds to components such as random access memory (RAM) and peripherals. As long as the components are on the mother board (which contains the main components of the computer), they can be directly connected to the processor and other system components through the traces on the mother board. However, whenever these components are not located on the mother board but are on a stand-alone board, a connector between the mother board and the stand-alone board is necessary. This connector may be a multiple pin connector on a peripheral expansion bus or a plug-in memory module connector on a memory expansion bus, for example.

These connectors have their disadvantages. A large amount of space on both printed circuit boards is required for such connectors. Any attempt to decrease the pitch of the pins results in an increase in the price of such connectors. The connector leads for such pins have a shape which is not well-suited for high-speed data transfer.

It is an object of the present invention to provide a circuit board assembly which is suitable for high speed data transfer and which is of simple construction.

Therefore, according to the present invention, there is provided a circuit board assembly, including first and second printed circuit boards, characterized by a plurality of electrical connection pads arranged in a two-dimensional pattern on a connecting surface of said first printed circuit board; a plurality of electrical connection pads arranged in a two-dimensional pattern on a connecting surface of said second printed circuit board which faces said connecting surface of said first printed circuit board; and a layer of anisotropically conductive material located between said first and second printed circuit boards and having a surface area large enough to cover said connection pads of said first and second printed circuit boards.

One embodiment of the present invention will now be described by way of example with reference to the accompanying drawings, in which:-

Fig. 1 is an exploded view of first and second printed circuit boards and the apparatus of the present invention;

Fig. 2 is an end view of the first and second printed circuit boards coupled together using the apparatus of the present invention,

Fig. 3 is a top view of a second embodiment of a pattern for arranging the connection pads of the present invention;

Fig. 4 is a top view of a third embodiment of a pattern for arranging the connection pads of the present invention; and

Fig. 5 is a top view of a second embodiment of the present invention.

Referring to Figs. 1 and 2, printed circuit boards 10 and 12 are to be connected together into an assembly 30. Printed circuit board 10 is preferably a mother board, while printed circuit board 12 may be a peripheral adapter card, a memory expansion card, or a daughter board.

Printed circuit boards 10 and 12 include connection pads 14 and 16, which are connected to the many electronic components of printed circuit boards 10 and 12 through traces 18 and 20. For signal traces, each connection pad on printed circuit board 10 preferably has a corresponding connection pad on printed circuit board 12. However, power and ground connection pads may have different geometries on each board. For example, a single large power connection pad on one printed circuit board may connect to many smaller power connection pads on the other printed circuit board.

Connection pads 14 and 16 are arranged in two-dimensional arrays, which may have a rectangular shape (Fig. 1), a square shape (Fig. 3), or an ovular or circular shape (Fig. 4), for example. Connection pads 14 and 16 are preferably flush with the connecting surfaces of printed circuit boards 10 and 12 as shown in Fig. 1, but they may be raised slightly higher than the connecting surfaces as shown in Fig. 2. The rows of Figs. 1 and 2 are arranged parallel and adjacent to the connecting sides 22 and 24 of printed circuit boards 10 and 12; however, connection pads 14 could be anywhere within the surface area of printed circuit board 10. For example, a mother-daughter board combination shown in Fig. 5 requires connection pads 14 to be located away from sides 22.

Between connection pads 14 and 16 is a thin sheet or mat 26 of anisotropically conductive material. This material is commercially available. A suitable material is ECPI (elastomeric conductive polymer interconnect) material, available from AT&T Corp. The boards are then pressed together and held in place by fasteners 28.

Advantageously, more connections per unit area of board surface can be made than with the typical one-dimensional multiple pin connector. Connection pads 14 and 16 may be arranged to meet specific space requirements. Here, connection pads 14 and 16 are shown as square in shape, but they may also be circular (Fig. 3) or any other shape to further minimize space requirements.

The electrical characteristics are also better and provide significantly higher maximum data transfer rates (bits per second) than ordinary connection schemes. The apparatus of the present invention is suitable for high-frequency applications up to 2 GHz, largely due to the shorter distance between the signal connectors on the respective circuit boards and the large contact areas, compared to traditional pin connectors.

Claims

1. A circuit board assembly, including first and second printed circuit boards (10,12), characterized by a plurality of electrical connection pads (14) arranged in a two-dimensional pattern on a connecting surface of said first printed circuit board (10); a plurality of electrical connection pads (16) arranged in a two-dimensional pattern on a connecting surface of said second printed circuit board (12) which faces said connecting surface of said first printed circuit board (10); and a layer of anisotropically conductive material (26) located between said first and second printed circuit boards (10,12) and having a surface area large enough to cover said connection pads (14,16) of said first and second printed circuit boards (10,12).

2. A circuit board assembly according to claim 1, characterized by fastening means (28) for coupling said first printed circuit board (10) to said second printed circuit board (12)

3. A circuit board assembly according to claim 1 or claim 2, characterized in that said connection pads (14,16) on said first and second printed circuit boards (10,12) are arranged in rows and columns in a substantially rectangular pattern.

4. A circuit board assembly according to claim 1 or claim 2, characterized in that said connection pads (14,16) on said first and second printed circuit boards (10,12) are arranged in concentric rings in a substantially circular or oval pattern

5. A circuit board assembly according to any one of the preceding claims, characterized in that said connection pads (14) on said first printed circuit board (10) are arranged adjacent the periphery of said connecting surface of said first printed circuit board (10).

6. A circuit board assembly according to any one claims 1 to 4, characterized in that said connection pads (14) on said first printed circuit board (10) are arranged within the interior of said connecting surface of said first printed circuit board (10)

7. A circuit board assembly according to any one of the preceding claims, characterized in that said first printed circuit board (10) is a mother board and said second printed circuit board (12) is selected from a memory expansion card, a peripheral card and a daughter board.

8. A circuit board assembly according to any one of the preceding claims, characterized in that said layer of anisotropically conductive material (26) is in the form of a mat sandwiched between said first and second printed circuit boards (10,12).

FIG. 1

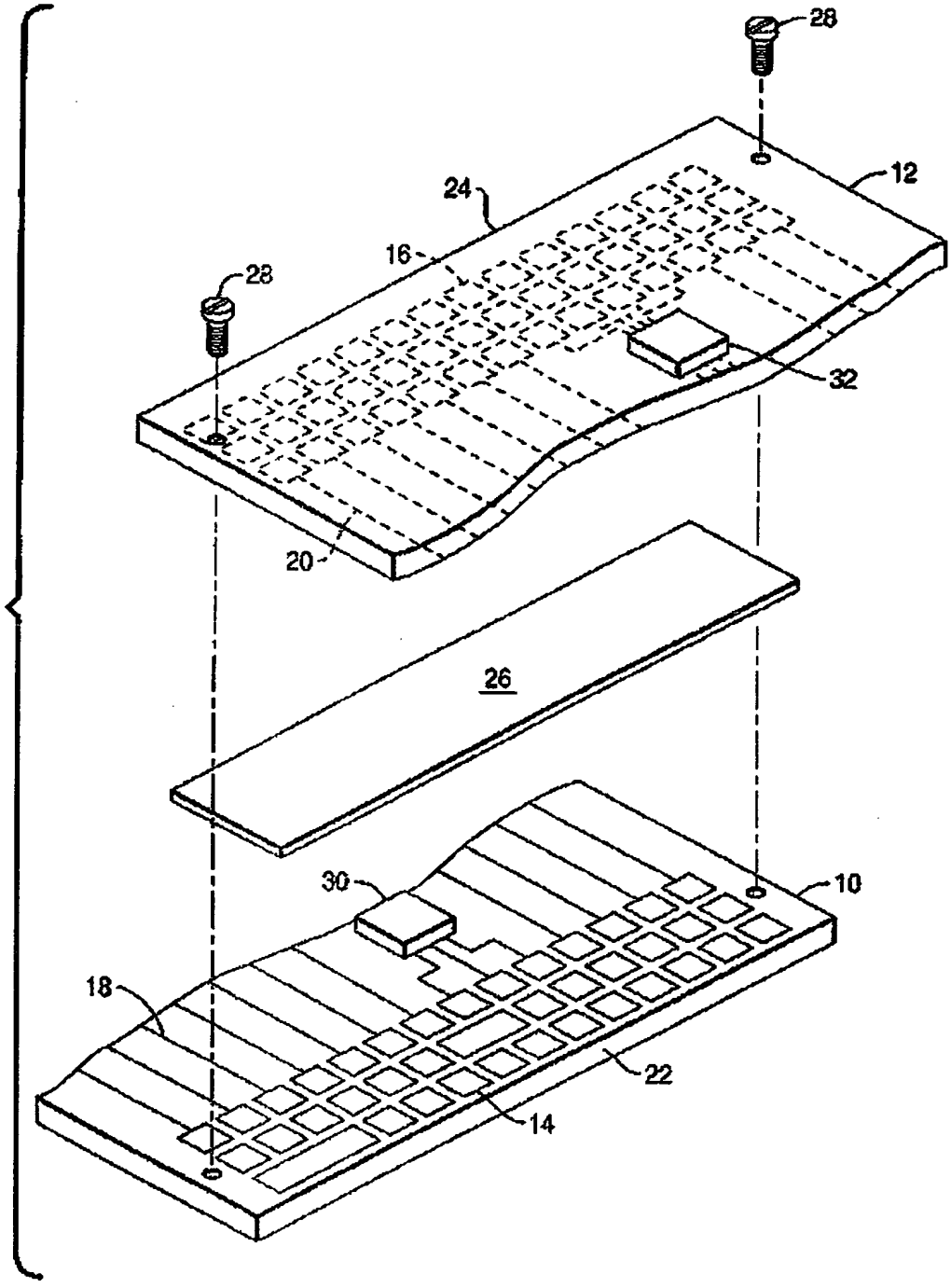

FIG. 2

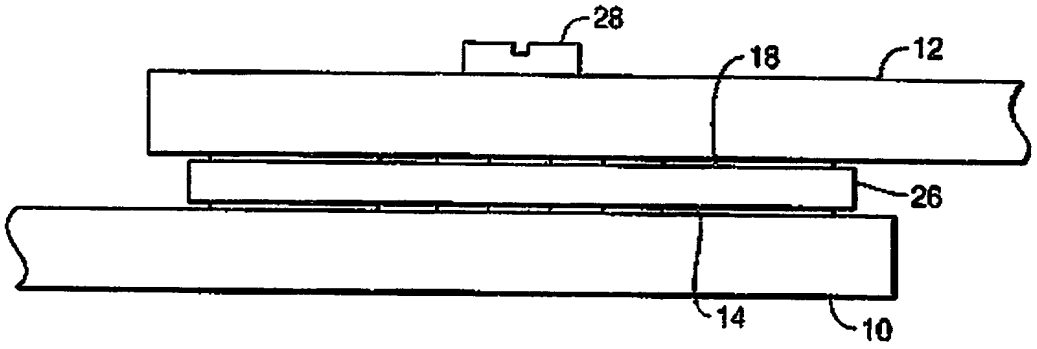

FIG. 3

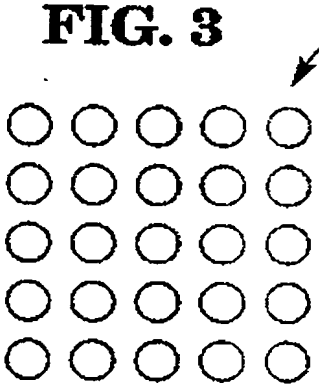

FIG. 4

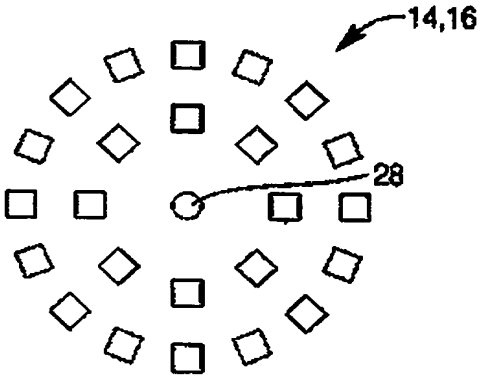

FIG. 5